feet and of 3.5° at 50 feet. But his observations cover only a few weeks in the hottest part of the year, from June 25 to August 6, and there is some uncertainty as to the protection of the thermometers.

G. J. Symons,[4] with observations from April to December, inclusive, at elevations of 4 feet and 170 feet above ground, finds a decrease of 1.9° F. in the mean maximum temperature at the upper station.

This matter is also discussed by Professor Abbe in the MONTHLY WEATHER REVIEW for 1897, vol. 25, p. 253, second column.

It is not at present practicable to answer the complex question as to what may be the exact nature and amount of the reduction of a temperature, wind velocity, or rainfall from elevated stations down to the exposure near the surface of the open ground. Undoubtedly on our elevated buildings the temperatures are slightly lower, the rain catch considerably smaller, and the wind velocity frequently larger than for stations at the surface of the ground, but comparison with other stations shows that the differences do not seem so large as has often been feared. So far as temperature is concerned, it is much more difficult to determine the true temperature of the air near the ground than at the top of a tall building, because at the ground the wind is much diminished and is liable to bring special streaks of hot and cold air. At the higher level, the special streaks of hot and cold air have all merged into one homogeneous mass, and the strength of the wind facilitates the ventilation of the thermometer shelter.

*F. O. S.*

[4] Proc. Roy. Soc., vol. 35, p. 349.

## THE WEATHER OF ICELAND AND EUROPE.

An interesting paper was read by Professor Hann before the Academy of Sciences at Vienna on January 7, entitled "The anomalies of the weather in Iceland, during the interval 1851–1900, and their relations to the simultaneous anomalies of the weather in northwestern Europe." It is well known that for many years the meteorologists of Europe have desired telegraphic information from Iceland, with the assurance that daily weather reports from that locality would certainly be very helpful in making daily weather predictions. By analogy it has been supposed that similar telegrams from Hawaii and from the Aleutian Islands would be exceedingly useful to the forecasters on our Pacific coast. It has even been argued that inasmuch as weather changes do not always mean from west to east, it might sometimes happen that reports from Iceland would be useful to the American forecaster. In fact, when a great area of low pressure is central in Iceland, there really is reason to believe that it does influence American weather by drawing the air from our extreme north southward over Canada and New England.

The object of Professor Hann's investigation is to arrive at a few general ideas as to the relation between the weather of Iceland and of northern Europe. He has studied the monthly and annual averages of temperature, pressure, and precipitation for the last half century, as recorded at Stykkisholm, and more especially the departures of the individual months from the general average, as compared with corresponding departures for the stations at Greenwich, Brussels, and Vienna, and with those for Ponta Delgada. The following sentences contain some of his more interesting results.

As regards barometric pressure, the departures of barometric pressure in northwestern and central Europe are in the opposite direction to the simultaneous departures at Stykkisholm in 70 per cent, of the cases. The same is true of temperature in only 56 per cent, and of precipitation in only 68 per cent, when we compare Iceland with Brussels.

The relation between the departures in pressure at Stykkisholm and the simultaneous departures in temperature over central and northwestern Europe is much more pronounced. When negative departures in pressure prevailed at Stykkisholm, then the probability of a simultaneous positive departure in temperature in Europe is 82 per cent. Inversely, when the pressure departure is positive at Stykkisholm, then the temperature departure is negative in 73 per cent of the cases for northern Europe.

An area of low pressure is almost stationary during the winter in the neighborhood of Iceland; if this low pressure falls decidedly, the winter temperature of Europe rises; if the central low pressure is higher than usual, the temperature of Europe is lower. The three largest temperature departures for each month and the year at Greenwich were compared with the similar departures in Iceland. Out of eighty-three cases, 84 per cent occurred simultaneously with a great departure in pressure in the opposite direction at Stykkisholm. In general, present investigation confirms the rule first enunciated by Buchan that a mild climate in northwestern and central Europe is associated with low pressure over Iceland.

Professor Hann then investigates the relation between the simultaneous anomalies of pressure at Ponta Delgada, Azores, and Stykkisholm; also the general relation between the high pressure of the tropical Atlantic and the low pressure of Iceland. On the average of forty-two cases, a rise of 4.5 millimeters at Ponta Delgada means a fall of 2.4 millimeters at Stykkisholm, and a fall of 5.1 millimeters at Ponta Delgada means a rise of 4.4 millimeters at Stykkisholm. In general, the probability of an opposite change at these two stations is 77 per cent.

Already in 1897, Hildebrandsson, in his researches on centers of action in the atmosphere, has given tables for ten years and charts bringing out in a general way the relation between pressures throughout the globe; but Hann's studies for fifty years give us a numerical result showing that to a certain extent the great areas of high and low pressure over the land vary inversely. The greatest positive departures of pressure at Stykkisholm correspond in 80 per cent of the cases to negative departures at Ponta Delgada, and the great negative departures at Stykkisholm correspond to positive departures at Ponta Delgada in 87 per cent of the cases. If the pressure over the Azores is higher than the average and at the same time the pressure over Iceland is lower, as happened in 70 or 80 per cent of the cases, then the gradient of pressure over the Atlantic Ocean is increased. The atmospheric machine works more intensively, and vice versa. The mean gradient difference in pressure between the Azores and Iceland is 14.7 millimeters in December, 18.3 in January, 14.3 in February, and 9.8 in March. The cases where the pressure over the Azores is unusually high and over Iceland unusually low are especially interesting; they are not to be considered as a result of the location of the subtropical belt of high pressure, but as a consequence of an increased intensity in the atmospheric circulation. If the northeast trade blows more powerfully than usual, it increases the maximum pressure on its right-hand side; but by this process the great whirl in the North Atlantic Ocean is intensified and the pressure of the atmosphere at its center near Iceland is diminished. Therefore, the above-proven contrasts in the pressure anomalies over the Azores and Iceland operate like cause and effect.

The last section of Hann's memoir deals with the relation between Stykkisholm (65° 4′) and the nearest station on the east coast of Greenland, namely, Angmagsalik (65° 37′), distant about 800 miles from each other. Stykkisholm is on the western coast of Iceland. Between it and Angmagsalik flows the cold polar stream on the west and the warm Irminger stream on the east, giving Greenland a cold climate and Iceland a relatively warm one. On the average of seven years of observations, 1895–1901, the mean difference of temperature between the two stations is greatest in February, 8.1° C., and on the annual average is 5.3° C. The gradient of temperature per degree of a great circle (111 kilometers, 59.9 geographic miles, 69.1 statute miles) is 1.1° C. in winter and 0.9° on the annual

**average, which is certainly one of the largest temperature gradients over the free ocean surface anywhere. The gradient between Stykkisholm and the coast of Norway is 1.3/35=0.04. The mean temperatures for Angmagsalik, reduced to the fundamental period 1851–1900, are: February, −10.8°; July, +5.4°; annual, −2.6°. For Stykkisholm we have, for the same months, −2.7°, +9.7°, +2.8°, respectively. Northwest foehn winds occur at Angmagsalik from the interior of Greenland, and two interesting cases are described by Professor Hann.**

In a letter to the Editor, Professor Hann suggests that similar studies as to the relation between the American coast and the island of Bermuda are very desirable.—*C. A.*

## A HOMEMADE GLOBE.

For some years past the officials of the Central Office have been familiar with the use of the plain india rubber balls 3, 4, or 5 inches in diameter as a basis for representing the earth, its meteorological features, the solution of spherical triangles, and many problems that daily present themselves for study. Especially has Professor Bigelow frequently advocated the advantages derived from using such small spheres on which lines can be drawn and erased. We find the following note, by A. Morley Davies, on the same subject in the Geographical Teacher, published for the Geographical Association at London, vol. 2, p. 173.

> Listening at the Conference to Mr. Smith's paper on the use of globes, it has occurred to me that a simple plan I have followed might be of interest to other teachers. I obtained some plain india rubber balls, $3\frac{1}{2}$ inches in diameter, of a terra-cotta color, for a few pence. I then thrust a long hat pin carefully through each, as the axis of my globe. Some I left at this stage for general use; others I marked with a few circles (such as equator, ecliptic, etc.) in paint; the advantage of the terra-cotta color is that white and black markings show equally well on it, so that different circles can be clearly distinguished. To illustrate either the plane of the ecliptic or the division of the earth into sunlit and dark halves, I use a piece of stiff cardboard with a $3\frac{1}{2}$-inch circular hole cut out of it, into which the globe easily fits. The classes for which I use these balls are small ones; possibly in the case of large classes each pupil might make his own globe in this way. If anyone can suggest any substitute for hat pins, equally long and sharp but more rigid, it would be an improvement.

*C. A.*

## DOES THE AURORA EVER ENVELOPE THE WHOLE EARTH?

No aurora is on record as having enveloped the whole earth simultaneously. The most extensive auroras, such as August 28–29, 1859, were visible in the course of that night over the greater part of Europe, West Africa, North America, and the Atlantic; or September 1–2, 1859, visible in the same way in North America and west to the Sandwich Islands, but not visible in Europe, where it was daylight, but magnetic disturbances were recorded there. These auroras of 1859 also occurred simultaneously in the southern and northern temperate zones, being observed in Australia and Chile. The most extensive aurora I know of was February 4, 1872, visible from Siberia and northern Greenland to India, Egypt, and Florida; also in Australia, Mauritius, and Natal. It seems plausible that if we had complete auroral records from all over the world, these great auroras might have been traceable farther east and west, north and south, but of course they could not have been in the daylight. If an aurora is seen on three successive nights at any one place, it is usually spoken of as three different auroras. It would only be allowable to call this one continuous aurora over the whole circle of latitude when we can prove that it was continuously visible during the night time at stations in different longitudes entirely around the globe. I believe this has never been done, but we came very near it in this last aurora of October 30–November 1, 1903, for which we have records from eastern Europe, the Atlantic, North America, and a large part of the North Pacific, while Asia is still to be heard from.

As regards "an aurora enveloping the whole earth," that would necessitate observing auroras in the tropical regions, so as to connect the north temperate with the south temperate auroras. Certainly this has never occurred, and it is not even plausible as an actual occurrence during the last two centuries, although plausible as a hypothesis applicable to some other condition of the atmosphere and the earth. Aurora encircling the earth between latitudes 40° and 70° north or south is plausible, but not yet proven to have occurred by actual observation.

Among the general works on auroras are: Das Polarlicht, Hermann Fritz, Leipzig, 1881. Aurora Borealis, Alfred Angot, International Scientific Series, vol. 81, London, 1896. Auroræ, Their Characters and Spectra, J. Rand Capron, London, 1879.

The general catalogues of auroras give the stations from which records have been received, and therefore the geographic extent. These are: Verzeichniss beobachteter Polarlichter, Fritz, Wien, 1873. On the periodicity of the Aurora Borealis, Joseph Lovering, Memoirs of the American Academy of Arts and Sciences, vol. 10, Cambridge, 1868.

In Nature, 1878, vol. 17, p. 373, there is a later note by Fritz discussing the question as to the simultaneity of auroras in America and Europe. Of 2878 days on which auroras were observed in America, there are 1065 on which they were also seen in Europe.

Especially during the years 1869–1872, out of 715 aurora days in America, there were 379 simultaneously in Europe. The author argues that the aurora is not a cosmical but a local phenomenon. The last extensive catalogue of auroras is that of Tromholt, published by the Academy of Sciences at Christiania. It contains several studies on auroral frequency and geographical extent by the editor, J. F. Schroeder, according to which the maximum frequency occurs in the northern regions of Norway in January, but in the southern regions in September and March, again confirming the idea that it is a local rather than a cosmical phenomenon.—*C. A.*

## FAKE FORECASTS.

In ordinary mercantile business it is quite a common experience for the manufacturer of a good article that is rapidly growing in popular favor to find counterfeits or infringements on his patent springing up like mushrooms, and sometimes offering very serious and illegitimate rivalry. The Weather Bureau has gone through a very similar experience. In 1870 there were, we believe, no long-range forecasters known to the country, except the ordinary farmers' almanacs, and we doubt whether any but the most credulous placed any faith in them. I have often told of the confession of one of these almanac weather makers, who with a twinkle in his eye said that after the proper astronomical part of the almanac was completed, and when he was in the spirit for writing up the weather, he would sit down and make it up for a year ahead, or so long as he felt in the mood. He fully understood that some people can be gulled sometimes, but we all know that we can not fool *all* the people *all* the time. So far as we recall the names of those who have distinguished themselves for making popular weather predictions based on principles that are contrary to all our knowledge of meteorology, the list runs somewhat as follows: Vennor, 1875–1890; Hicks, 1890 to date; Dunne, 1892 to date; Foster, 1885 to date; Elmer, 1903 to date; Snavely, 1902–1904.

While these have been active in the United States, the rest of the world has also had its varied experiences. In England, Mr. Hugh Clements and his great expounder, Hon. William Digby, have vexed the printer with an imposing volume and the public with daily predictions in the local newspapers. These authors speak as confidently about the moon as Rev. Mr. Hicks does about Vulcan, Jupiter, and the other planets, real and imaginary. Italy and Austria have gone through a